ABSTRACT

Differential unitary space-time (DUST) communication is a technique for communicating via one or more antennas by encoding the transmitted data differentially using unitary matrices at the transmitter, and decoding differentially without knowing the channel coefficients at the receiver. Since channel knowledge is not required at the receiver, DUST is ideal for use on wireless links where channel tracking is undesirable or infeasible. Disclosed are a class of Cayley codes for DUST communication that can produce sets of unitary matrices that work with any number of antennas, and has efficient encoding and decoding at any rate. The codes are named for their generation via the Cayley transform, which maps the highly nonlinear Stiefel manifold of unitary matrices to the linear space of skew-Hermitian matrices. The Cayley codes can be decoded using either successive nulling/cancelling or sphere decoding.